can be obtained an insulation film having its structure that is different from that obtained by burning the insulation film by only the heating process (for example, an organic silicon oxide film with its low dielectric rate having a structure close to the SiO_2 film, for example).

In addition, according to experiments made by the Inventor et al, when a vanish is irradiated with the electron beam in the step 4, a heating process is applied so that the vanish temperature is obtained as a substantially constant temperature within the range of 200℃ or more and not more than 500℃, and preferably about 380℃ to about 400℃, whereby it is evident that there is formed a good quality polymethyl siloxane film such that the semiconductor device 206 can provide practically proper operating performance. In particular, a very good quality polymethyl siloxane film is formed at about 400℃.

In addition, according to experiments made by the Inventor et al, in the step 4, an irradiation quantity is set so as to obtain a substantially constant value at the total irradiation quantity about 5000 $\mu C/cm^2$ or more, and a vanish is irradiated with the electron beam, whereby it is evident that a good quality polymethyl siloxane film is formed such that the semiconductor device 206 can provided practically proper operating performance. In particular, a very

good quality polymethyl siloxane film is formed at the total irradiation quantity about 5000 $\mu C/cm^2$.

Similarly, according to experiments made by the Inventor et al, in the step 4, acceleration energy is set so as to obtain a substantially constant value within the range of about 1 keV to 15 keV, and a vanish is irradiated with the electron beam, whereby it is evident that a good quality polymethyl siloxane film is formed such that the semiconductor device 206 can provide practically proper operating performance. In particular, a very good quality polymethyl siloxane film is formed at about 6 keV.

Further, according to experiments made by the Inventor et al, in the step 4, a vanish is disposed in a pressure reducing atmosphere within a predetermined range, thereby clearly making it possible to form a good quality polymethyl siloxane film such that the semiconductor device 206 can provide practically proper operating performance. In particular, a vanish is disposed in a nitrogen atmosphere set to a substantially constant pressure reducing value of about 0.1 Torr, whereby a very good quality polymethyl siloxane film is formed.

As has been described above, according to the present embodiment, in the step of forming a polymethyl siloxane film that is a second interlayer insulation film 204, the heating process and the electron beam

irradiation process are used in combination, whereby a modified layer 204b with its etching rate lower than both ends of the layer can be easily formed at an intermediate part in the film thickness direction of the polymethyl siloxane film.

In this manner, of both ends in the film thickness direction of the polymethyl siloxane (top and back faces of the polymethyl siloxane film), a deviation in etching rate in the end face to be etched (in the surface of the polymethyl siloxane film) is easily reduced in the modified layer 204b. As a result, a difference in depth between the wiring groves 205a and 205b due to a difference in etching rate is easily reduced.

That is, according to the present embodiment, processing precision due to etching of the polymethyl siloxane film can be easily improved. In this manner, the yields of the semiconductor device 206 can be improved.

In addition, according to the present embodiment, the heat process and the electron beam irradiation process are used in combination, whereby the electrical performance (quality) of the polymethyl siloxane film can be easily improved. In this manner, the electrical performance of the entire semiconductor device 206 can be easily improved. In addition, a variety of semiconductor devices with high throughputs can be